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STUDIES OF NEOTROPICAL CADDISFLIES, XXXIV: THE GENUS *PLECTROMACRONEMA* (TRICHOPTERA: HYDROPSYCHIDAE)

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Abstract.—The new species, *P. lisae*, is described from Mexico and also recorded from Costa Rica. The distributions of the three known species are reviewed and figures of wings and male genitalia given. The larva and pupa of *P. lisae* are described and figured. They inhabit long, silk and sand tubes attached to rocks in the bottom gravel in lotic situations and appear to be strongly predatory. No traces of any capture net were found. A key is presented to the larvae of the six Neotropical Macronematinae genera in which this stage is known.

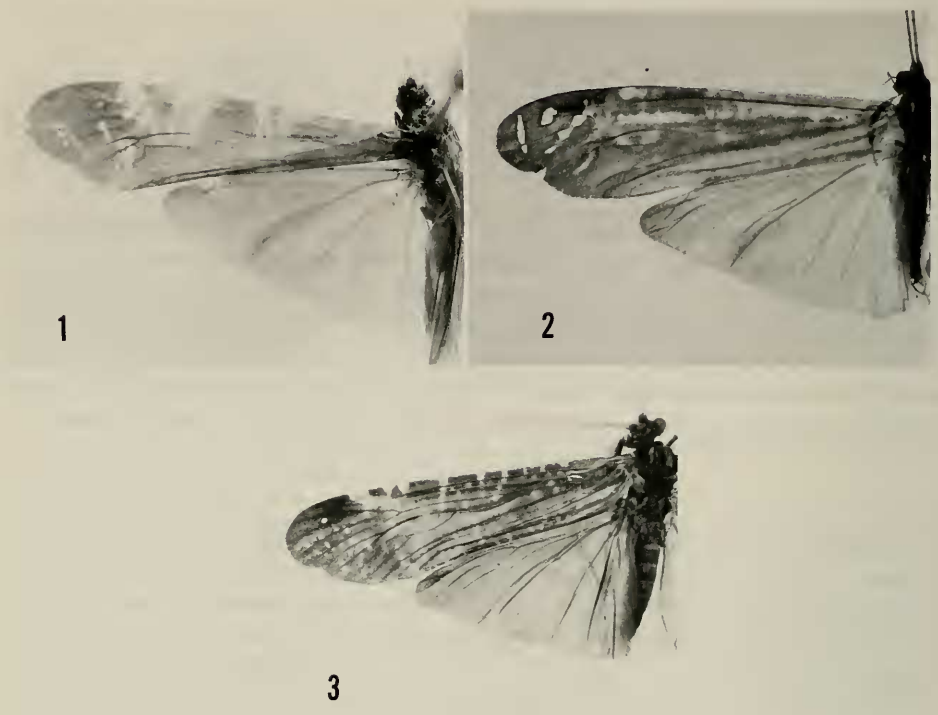
Plectromacronema was established in 1906 by Georg Ulmer for the new species *comptum*, taken at Santarem, Brazil. Subsequently the species was recorded from Venezuela (Navás 1924), Guyana (Mosely 1931), and Suriname (Flint 1974). Nathan Banks (1920) described the new genus and species *Podomacronema subfuscum* from northeastern Argentina. I synonymized this genus in 1967 with *Plectromacronema*, but recognized the distinctness of the two species. The genus has contained until now these two species, one from northern South America, the other from northeastern Argentina.

In the summer of 1966, when on a field trip to Mexico and Guatemala, my daughter Elizabeth (familiarly Lisa) called my attention one dusk to a swarm of large, dark caddisflies active over a pool on a small stream in the coastal mountains of Chiapas, Mexico. As soon as one was caught, it was obvious to me that these must be a species of *Plectromacronema*, but far from the known range of the genus. A good series was obtained on this occasion, and the next summer a single example was beaten from a riverside tree in Costa Rica. Attempts on several occasions to find the immature stages of the genus at the Chiapas site were unsuccessful.

In May of 1981, Dr. Paul J. Spangler, my wife and I travelled to Mexico, where, at the invitation of Dr. Joaquin Bueno S., we helped with a field course in aquatic insects, then all travelled into southern Chiapas, collecting there. At the Río Lacanja, 22 km east of Ocosingo on the road to Palenque, we discovered some interesting long, silken caddisfly tubes attached to large stones in the river bottom. Many of them still contained hydropsychid larvae, and a few mature pupae. That night many females (and a teneral male) of the new species of *Plectromacronema* came to our lights. Study of the metamorphotypes in Washington proved that at long last the larvae and pupae, previously unknown, of this genus were firmly associated with the adults.

Plectromacronema Ulmer

The three species of the genus fall into two well defined groups based on leg structures. *Plectromacronema comptum* is alone in having a spur count of 1,4,3



Figs. 1–3. Wings: 1, *Plectromacronema comptum*; 2, *P. subfuscum*; 3, *P. lisae*.

(Ulmer claimed a second spur on the foreleg, but I can not see anything macroscopic), and in having the basitarsus of the foreleg elongate and nearly cylindrical. The other two species have a spur count of 2,4,4, and the basitarsus of the foreleg elongate, but at midlength greatly widened and flattened. However, the general appearance and uniformity of the male genitalia in all three species precludes the restoration of two genera for the two species groups.

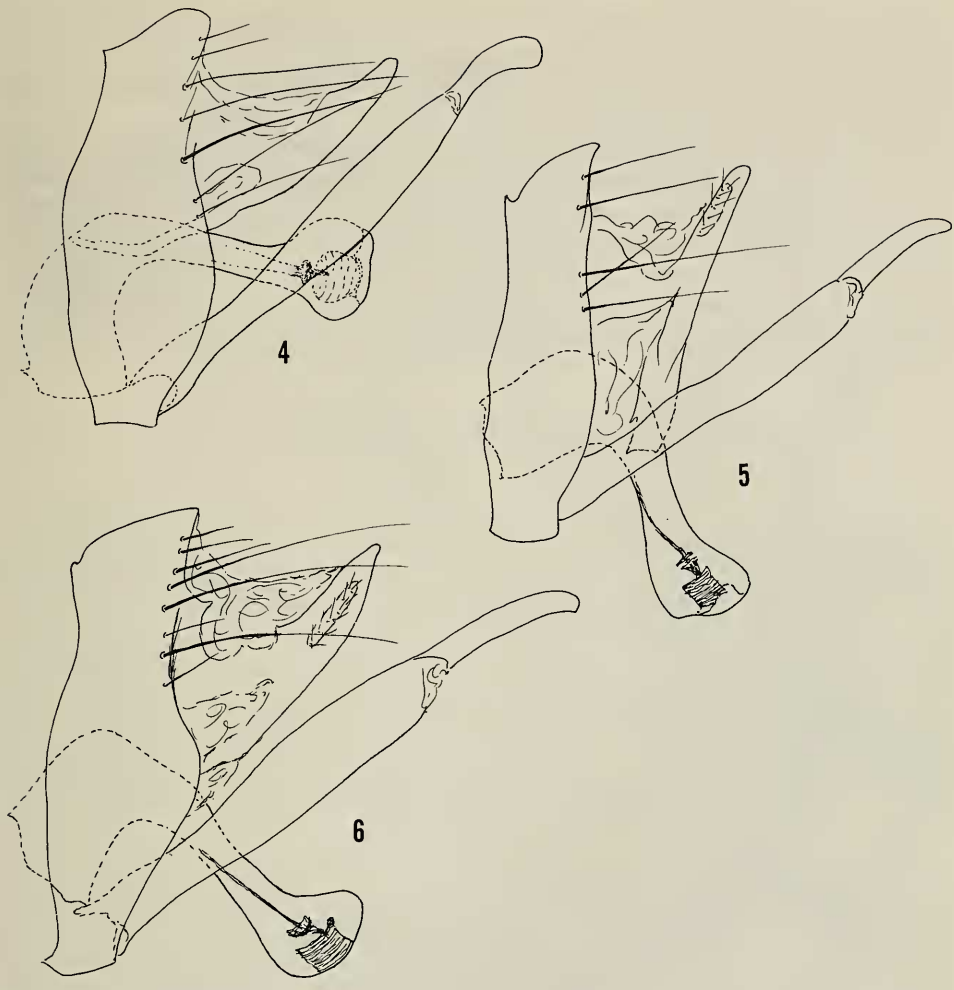
The three species are easily distinguished by the color patterns of the forewings, even though there is considerable variation in the exact numbers and placement of the spots. Male genitalia differ very slightly between the three species, with the tip of the aedeagus offering the best characters.

Plectromacronema comptum Ulmer
Figs. 1, 4

Plectromacronema comptum Ulmer, 1906:63–65.—Fischer, 1963:163–164.—Flint, 1974:114–115; 1978:395, 403.

This species is easily recognized by the coloration which shows three clusters of pale marks on the front margin of the forewing. Posteriad of these pale marks are many scattered, small, variable, pale spots.

Biology.—The immature stages of this species are unknown. My few experiences with adults, as well as collection records, indicate that the species inhabits large rivers. Three collection records (Flint 1974) contain the note "on water surface," in the evening, or during rainfall.



Figs. 4–6. Male genitalia, lateral: 4, *Plectromacronema comptum*; 5, *P. subfuscum*; 6, *P. lisae*.

Distribution.—In the literature the species is recorded from Brazil, Guyana, Surinam, and Venezuela. The following records either add new countries or major political subdivisions. French Guiana, 60 mi up Maroni River, Wm. Schaus, 1 ♀. Venezuela, Edo. Bolivar, Anacoco (6°5′N, 61°8′W), 60 m, 10–30 Aug 1979, 3 ♀ (IZAM); Río Cuyuni, El Dorado, 10 Feb 1976, C.M. & O.S. Flint, Jr., 1 ♀.

Plectromacronema subfuscum (Banks)
Figs. 2, 5

Plectromacronema comptum Ulmer.—Ulmer, 1913:392–393 (Misidentification).
Podomacronema subfuscum Banks 1920:356.—Fischer, 1963:164.
Plectromacronema subfuscum (Banks).—Flint, 1967:12.

In coloration this species has a rather dark anterior margin of the forewing, with several distinct, white spots in the apical fourth. The pale marks on the basal three-fourths of the wing have a distinctive, blurred appearance.

Biology.—The immature stages of this species are also unknown. I have taken adults at lights near small- to medium-sized watercourses, generally with alternating riffles and pools. Collections at light are almost exclusively females, rarely with teneral males appearing.

Distribution.—This species is found well to the south of the ranges of the other two species. It has only been recorded from the Province of Misiones in Argentina, where I have also made several collections. The following are new country records: Brazil, Edo. Santa Catarina, Nova Teutonia (27°11′S, 52°23′W), 28 Oct–2 Nov 1939, F. Plaumann, 1 ♂, 12 ♀ (MCZ, USNM); same, but 7 Jan 1964, 1 ♂. Uruguay, Dpto. Artigas, San Gregorio, 29 Nov 1959, C. S. Carbonell, 4 ♂, 10 ♀ (FHCU, USNM). Dpto. Paysandú, Puerto Pepe-Ají, 1 Dec 1959, C. S. Carbonell, 11 ♀ (FHCU, USNM).

Plectromacronema lisae, new species
Figs. 3, 6–23

This species is most closely related to *P. subfuscum*, with which it shares a similar spur count and structure of the foreleg, but from which it is easily distinguished by coloration. The pale spots are clear and distinct, and there is a regular series of pale marks along the costal margin which are not aggregated into three large marks as they are in *P. comptum*, nor limited to three large spots in the apical fourth as they are in *P. subfuscum*. Differences in the male genitalia between the three species are minute and seem to be primarily in the shape of the apex of the aedeagus. In *P. comptum* the tip is more rounded both above and below the stem; in the other species the tip is more enlarged above the stem than below. In *P. lisae* this enlargement is rather abrupt and almost as high as long, but in *P. subfuscum* it is distinctly longer than high.

Adult.—Length of forewing, ♂ 14–18 mm, ♀ 13–16 mm. Color fuscous; antennae basally golden yellow, legs stramineous, basitarsus of foreleg infuscate; forewing fuscous marked with small hyaline spots, those of costal margin being considerably enlarged. Fifth abdominal sternum anterolaterally with oval, clear, raised boss. Male genitalia: Ninth segment annular, slightly produced dorsomesally. Tenth tergum elongate, with membranous areas dorsomesally and laterobasally; apices pointed, deeply divided dorsomesally. Clasper elongate, slender, basal segment nearly parallel-sided; apical segment terete, clearly separated from basal segment. Aedeagus with erect, broad, basal section, stem at right angles to base; apex with ventral margin confluent with base of stem, dorsal margin produced dorsad, about as high as long; internally with single duct with distinct collar subapically, and ending in cylindrical cavity extending inward from center of posterior surface.

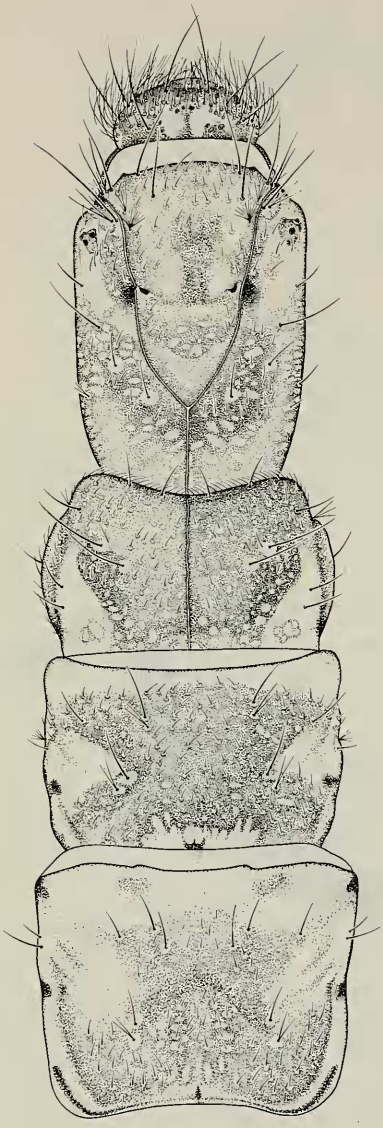
Larvae.—Length to 16 mm, width to 3 mm. Sclerites yellow with fuscous markings.

Head.—Elongate, about 1½ times as long as broad. Color basically yellow, infuscate dorsally with distinct, pale, muscle scars. Frontoclypeus with anterior margin convex; anterior fourth with small accessory setae, with anterolateral palmate hairs. Gena with surface smooth, with few small setae; ventrally lacking stridulatory grooves, with row of stout, spicate setae along each side; ventral ecdysal line lacking on one side of anterior apotome. Labrum rounded anteriorly,

Fig. 7. *Plectromacronema lisae*, larva, lateral.

almost semicircular in outline; anterior half hairy with anterior margin very hairy. Mandibles with strong mesal teeth and multiple, sharp, apical teeth; no mesal brushes. Submentum evenly convex anteriorly; setate laterad. Labium very long, slender, sclerotized.

Thorax.—Pronotum dark mesally with pale muscle scars, paler laterad; meso- and metanota darkest mesally, paler laterally. Pronotum with anterior margin bearing fringe of slender, short hairs; surfaces of all nota smooth, with scattered



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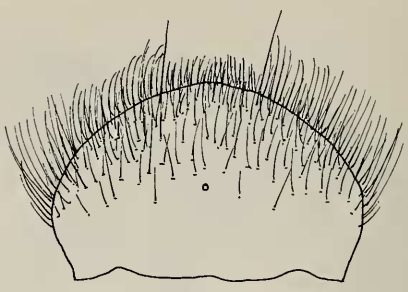

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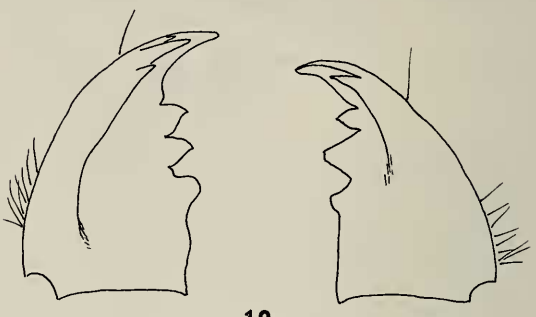

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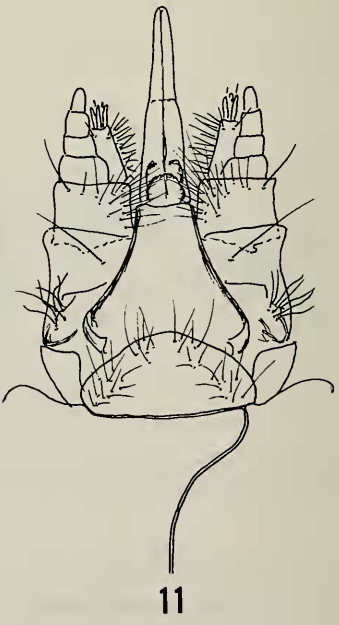

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Figs. 8–11. *Plectromacronema lisae*, larva: 8, head and thoracic nota, dorsal; 9, labrum, dorsal; 10, mandibles, dorsal; 11, maxillolabium and anterior margin of genae, ventral.

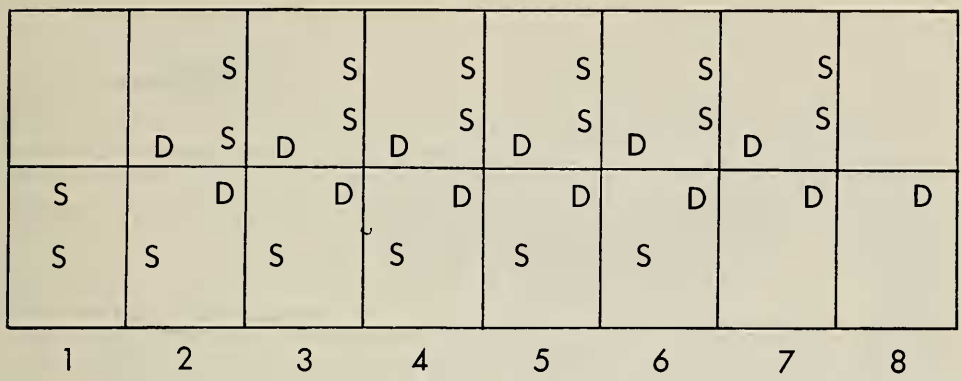


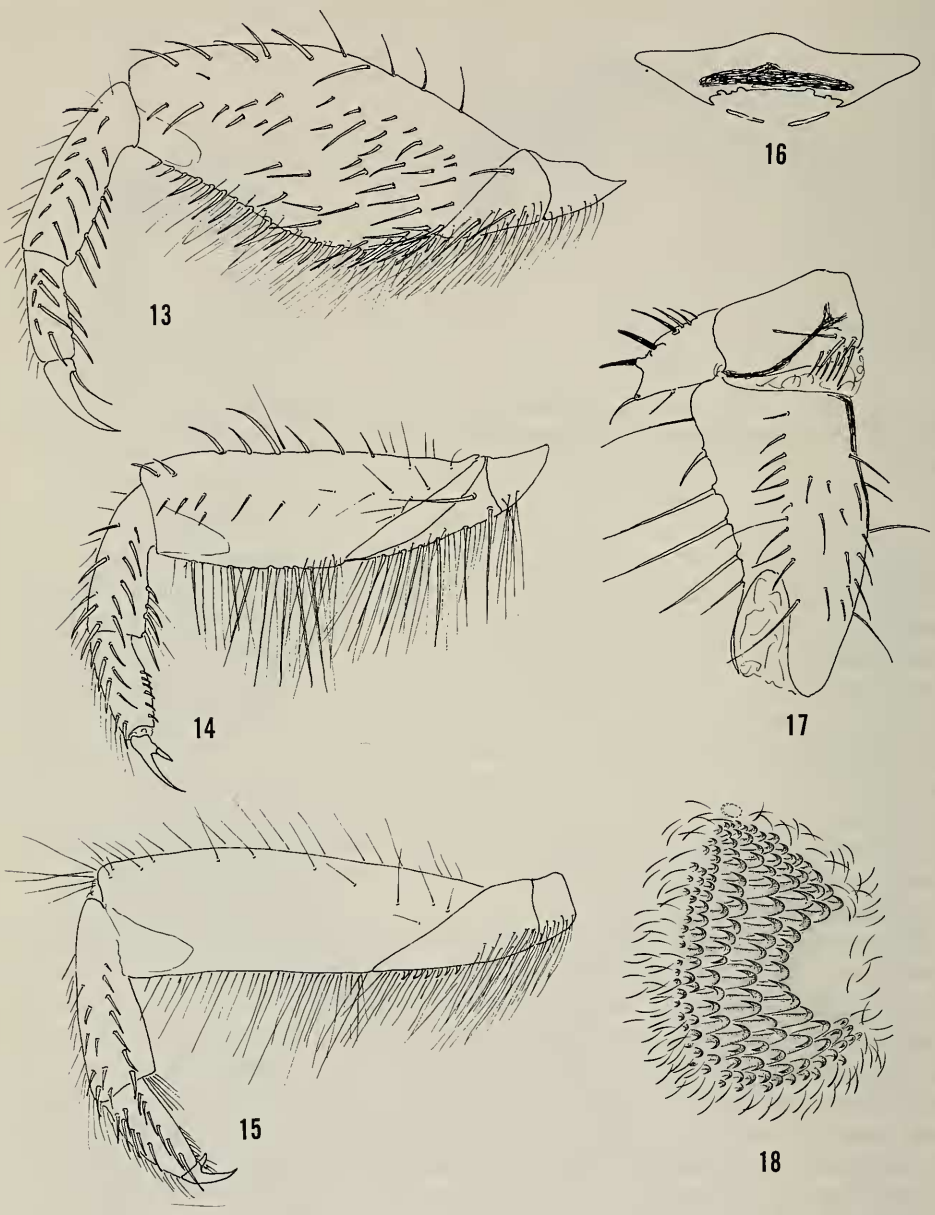
Fig. 12. *Plectromacronema lisae*, schematic gill diagram of lateral aspect of first 8 abdominal segments. S = a single, long, central stalk with lateral filaments; D = 2 S-type gills with adjacent bases.

small, decumbent hairs and few erect setae. Prosternite transverse, narrow, with dark central mark; meso- and metasterna unornamented. Foretrochantin broad, tapering to blunt point apically, with 3 or 4 large, bladelike setae dorsally, arising from large bases. All legs nearly equal in length, forefemur distinctly widened. Foreleg with inner face of femur, tibia and tarsus with rows of enlarged, bladelike setae; ventral margin of femur with fringe of long hairs and row of short, bladelike setae. Midleg with inner face of tibia and tarsus with rows of enlarged, bladelike setae; ventral margin of femur with fringe of long hairs, dorsal margin with scattered spinous setae. Hindleg with inner face of tibia and tarsus bearing rows of short, bladelike setae; ventral margin of femur with sparse fringe of long hairs; ventral margin of trochanter with row of very short, enlarged setae in fringe of long hairs. No thoracic gills.

Abdomen.—Gills consisting of central stem bearing many lateral filaments; placed as in Fig. 12; double gills above lateral line often with bases separated, very small posteriad and virtually lost in lateral line. Lateral line lacking on segments 1–3; very long and dense on segments 4–7, curving ventrad anteriorly on segment 8, with complete fringes over dorsum along posterior of segments 4 and 5. Integument with many, darkened, decumbent setae, and few, scattered, erect setae. Segments 2–8 with paired, ventrolateral pockets (generally appearing to be slightly invaginated with posterior face partially folded over opening, occasional examples appear to have pockets everted and almost proleg-like with covering of crotchets), bearing dense rows of spines whose tips are hooked anteriad. Sternum 9 bearing pair of ovoid sclerites, with posteriorly directed, bladelike setae on basal ¾, posterior fourth with long setae; ventrolaterally with long setae. Anal gills, if present, not showing. Anal proleg with scattered setae; anal brush reduced to 4 long setae; anal claw sharply angled ventrad, ventral sole plate with dense brush of dark setae.

Pupa.—Length to 16 mm, width to 3 mm.

Head.—Labrum semicircular with rounded basolateral lobes; basolateral lobe with 5–6 setae, anterolateral margin with 7–10 setae each side. Mandibles scler-



Figs. 13–18. *Plectromacronema lisae*, larva: 13, foreleg, inner face; 14, midleg, inner face; 15, hindleg, inner face; 16, prosternite; 17, propleuron and coxa, lateral; 18, abdominal hook-pocket, anterior to left.

otized, elongate, almost parallel-sided, inner margin coarsely serrate; basolateral surface with brush of setae. Face with scattered setae; vertex with brush of about 12 setae; basal antennal segment with brush of about 10 setae.

Thorax.—Meso- and metanota with 2 pairs of short, submesal setae, one pair near anterior margin, other at midlength. Coxae of all legs with apical tuft of dark

setae. Midleg with tibia and tarsus flattened and broadened; tarsus with short, but dense, lateral fringe.

Abdomen.—Segments 2–7 bearing lateral gills, those on 4–7 being somewhat united basally; with ventral gills on 2–7. Hook plates anteriorly on segments 3–8, becoming progressively more erect posteriad; posterior plate on segment 3. All segments with few erect setae posteriad; segments 3–7 with band of scattered, posteriorly-directed, spinous setae along posterior. Eighth sternum with pair of oval sclerites bearing many, posteriorly-directed, bladelike setae. Apical processes elongate, slightly arcuate, rugose, apex broad with thin plate dorsally; with scattered setae.

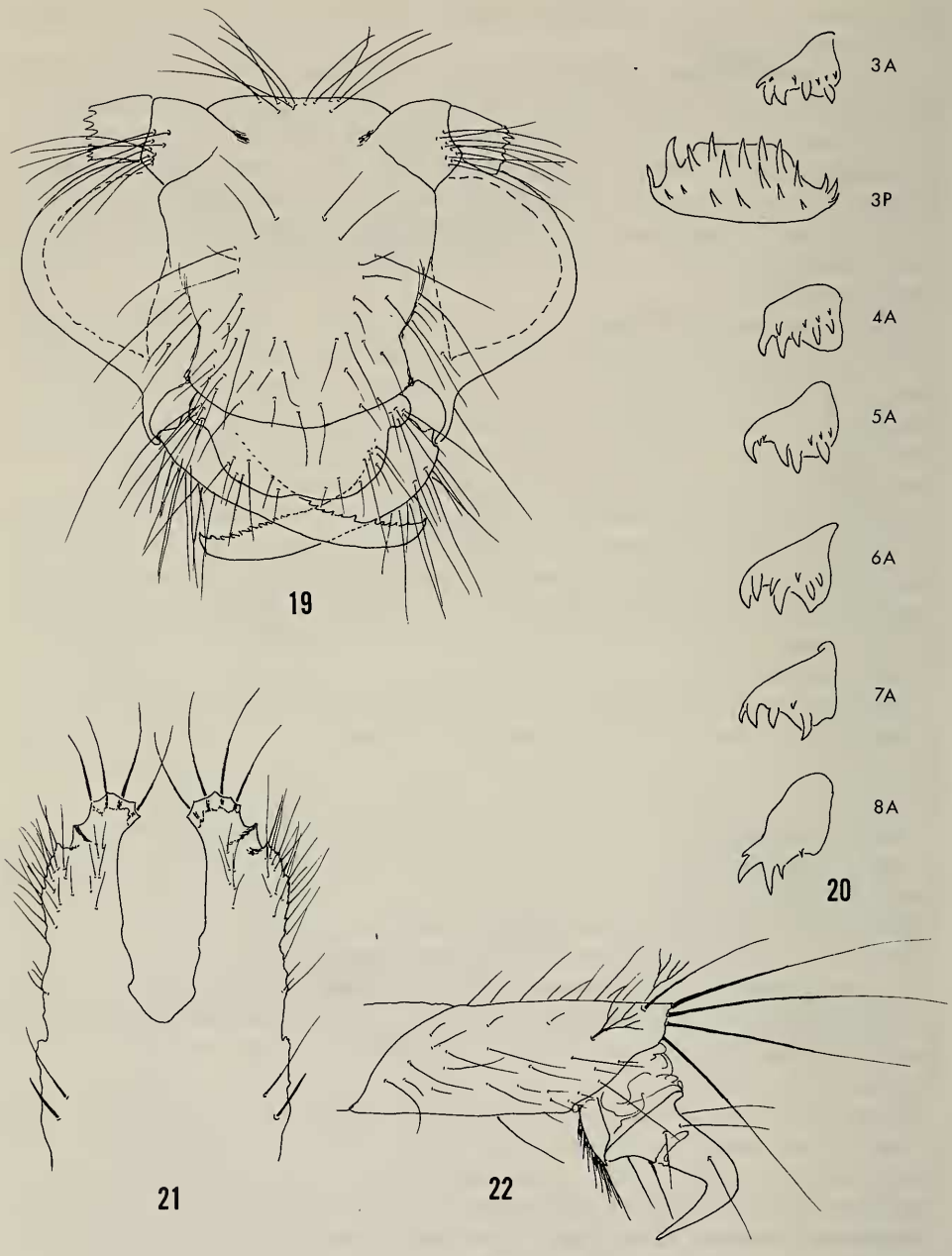
Material.—Holotype, male: Mexico, Edo. Chiapas, rt. 185 km 35 [12 km north Arriaga], 7–8 July 1966, Flint & Ortiz. USNM Type 100590. Paratypes: same data, 19 ♂; Río Lacanja, 22 km north Ocosingo, 19 May 1981, C.M. & O.S. Flint, Jr., 1 ♂, 21 ♀; same, but J. Bueno & H. Velasco, 3 ♂, 8 ♀ (IBUNAM). Costa Rica, [Pcia. Guanacaste], Río Corobici, [3.4 mi north] Las Canas, 15 June 1967, Flint & Ortiz, 1 ♂. Other: Río Lacanja site, 20 larvae, 7 pupae.

Biology.—The three collections of this species all were made at fast-flowing, clear, cool streams of apparent good water quality with bottom of sand, gravel, large stones and boulders. In size they varied greatly; the stream at the type-locality is barely half a meter wide by a few decimeters deep, the Río Lacanja is about 10 meters wide by half a meter deep, and the Río Corobici perhaps about 15 meters wide.

The adult males of the type collection were taken just before dusk, flying in a swarm up to a meter or so above the water surface over a small, sand-bottomed pool. The Costa Rican male was beaten from a low branch of a riverside tree, and the Río Lacanja adults all came to an ultraviolet light after dark.

The larvae were found in the Río Lacanja inhabiting long silken tubes incorporating sand grains and small pebbles which were partially attached to large rocks resting in the bottom sand and gravel. They were most frequently found where the current was the strongest, flowing between contiguous rocks in a rather coarse sand mixture. The tubes did not extend noticeably above the level of the sand, and their posterior ends were usually free of the rock, although for most of their length they were attached to the rock. When removed from the water many larvae crawled from their tubes, as did some of the mature pupae from the bottoms of their tubes.

In the laboratory, the long tubes proved to be difficult to interpret, there being no way to be absolutely certain as to which was anterior or posterior, nor if the whole tube was present. The longest tube was 70 mm long and from 5–10 mm in diameter. The inner surface was formed of a dense mat of silk to the outside of which was cemented sand grains. Some parts were only silken, but gave the appearance of having been attached to a smooth object, probably the host rock or a large pebble. The inner diameter of the tube appears to be slightly larger than the diameter of the larva. Several tubes showed a flared, silk-lined opening at one end, which I interpret to be the upper end. In no tube could I find any type of structured catching net. The pupae inhabit tubes appearing identical to those of the larvae. In only one of five tubes still containing pupae did I find a mass of debris behind the pupa with admixed larval sclerites; in all the other tubes this region was open and the sclerites gone. Those tubes that appeared



Figs. 19–22. *Plectromacronema lisae*: 19, pupal head, anterior; 20, pupal hook plates, with abdominal segment number and anterior or posterior position; 21, pupal apical appendages, dorsal; 22, larval anal proleg, lateral.

Fig. 23. *Plectromacronema lisae*, habitat, Río Lacanja.

nearly complete contained the pupa near the posterior end (to judge from the orientation of the pupa). There was no solid anterior closure, but the anterior portion was loosely clogged with sand and debris, sometimes with a loose mesh of silken strands at the bottom of this sand. Below this, there was a long portion of the tube, one to three times the length of the pupa, that was clean and in which the pupa apparently moved.

Four larval guts were cut open and the contents examined. One was mostly empty, but did contain the recognizable remains of a small larva of a polycentropodid caddisfly and a chironomid head capsule, plus a quantity of an amorphous blackish material. A second was filled with the blackish material, recognizable sclerites of small arthropods, and apparently large pieces of arthropod cuticle. The third contained only a very small amount of fine blackish matter, and the fourth, larger quantities of the same. In conjunction with the strongly spined legs, rows of spines on the venter of the head, and sharply pointed mandibles, it seems probable that the larvae are strongly predatory, but the brushes on the labrum and femora suggest that they may also brush fine particulate organic matter from

the substrate. Perhaps they utilize the silken lining of the tube to strain fine particulate organic matter from the water, in a manner similar to that of the Philopotamidae (Wallace and Malas 1976).

Neotropical Macronematine Larvae

With the discovery and description of the larvae of *Plectromacronema*, only the immature stages of *Centromacronema*, *Pseudomacronema*, and *Neoleptonema* remain undescribed of the nine Neotropical genera of Macronematinae. It is quite probable that the larvae of *Neoleptonema* will key to *Leptonema*, as the genera are very similar and probably not distinct. It is more difficult to speculate on the appearance of the other two genera. They may well run to couplet 5, or *Centromacronema* may approach the appearance of *Macronema* in couplet 3.

In order to aid in the recognition of the larvae of the Neotropical macronematine genera, I offer the following provisional key which incorporates references to recent descriptions and name changes.

1. Foretrochantin very broad, almost rectangular; forefemur broad and truncate apically; head and thoracic nota very long and slender (Roback 1966, as Hydropsychidae sp.1) ..... *Synoestropsis*
– Foretrochantin pointed anteriad; apex of forefemur not broad and truncate; head and thorax not disproportionately elongate 2
2. Abdominal sterna 2–7 with paired, ventrolateral pockets bearing recurved hooks ..... *Plectromacronema*
– Abdominal sterna lacking such structures 3
3. Anal proleg very long and slender, jointed in the middle (Flint and Bueno 1982) ..... *Macronema*
– Anal prolegs neither exceedingly long nor jointed 4
4. Head without a carina on genae (Flint and Wallace 1980) ..... *Leptonema*
– Head with a carina on genae 5
5. Carinae of genal halves meeting at posterior of frontoclypeus, encircling the frontal area of the head (Wiggins 1977, as *Macronema*) ..... *Macrostemum*
– Carinae on genal halves not meeting on midline of head, frontal area of head open to the posterior (Flint and Wallace 1980) ..... *Blepharopus*

Acknowledgments

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